THE WEATHER AND CIRCULATION OF JANUARY 1952[1]

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The first month of 1952 was characterized by relatively mild winter weather in about three-fourths of the United States. This is portrayed in Chart I–B where it may be seen that in almost all portions of the country eastward from the Plateau region temperatures averaged above January normals. Temperature departures exceeded +6° F. in a broad belt extending from Colorado and New Mexico eastward to the Atlantic Coast as well as in the Ohio Valley and Middle Atlantic States. The warmest weather, with respect to normal, was found in eastern Texas and southwestern Louisiana. As an example of the warmth in Texas, Fort Worth reported maximum temperatures in excess of 70° F. on almost half the days of the month. The only areas in the Nation with below-normal temperatures were the Far West and the northern border States west of Wisconsin, where wintry weather was often quite severe.

As might be expected from the predominant warmth over the United States, the upper air flow pattern in the Nation consisted of waves with relatively small amplitude, so that zonal flow predominated over meridional

[1] See Charts I–XV following page 13 for analyzed climatological data for the month.

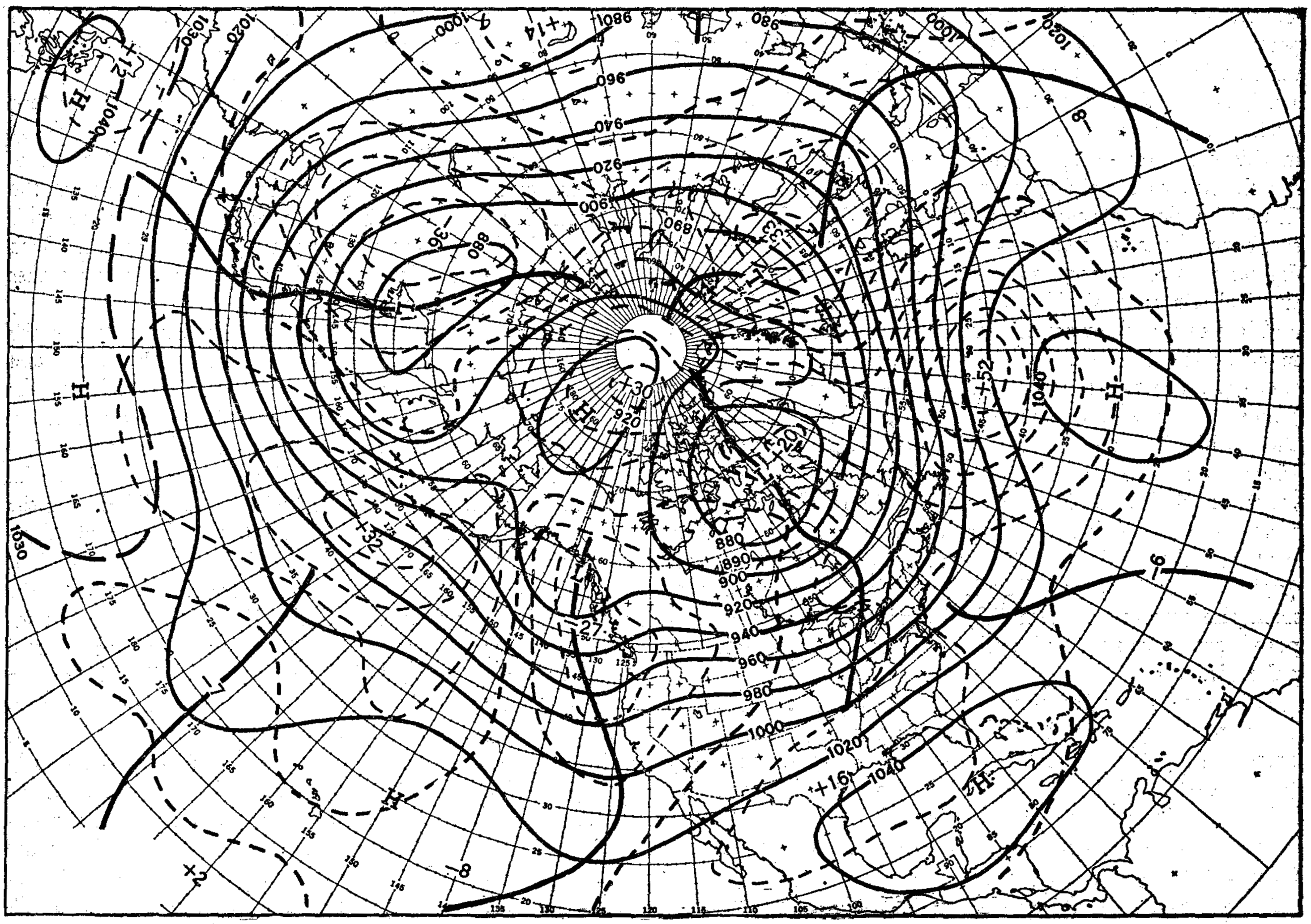


Figure 1.—Mean 700-mb. chart for the 30-day period January 1–30, 1952. Contours at 200-ft. intervals are shown by solid lines, intermediate contours by lines with long dashes, and 700-mb. height departures from normal at 100-ft. intervals by lines with short dashes with the zero isopleths heavier. Anomaly centers and contours are labeled in tens of feet. Minimum latitude trough locations are shown by heavy solid lines.

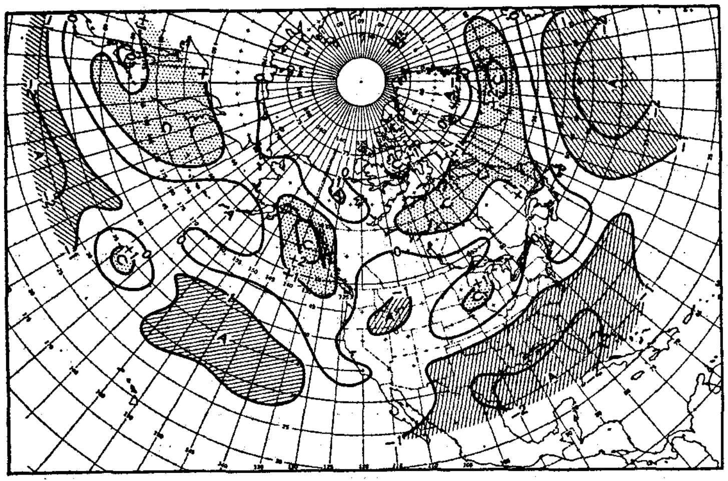


FIGURE 2.—Vertical component of mean relative geostrophic vorticity at 700 mb. for the 30-day period January 1–30, 1952 in units of 10^{-5} sec^{-1}. Areas of cyclonic vorticity in excess of 1×10^{-5} sec^{-1} are stippled and labeled "C" at the center; areas of anticylonic vorticity less than -1×10^{-5} sec^{-1} are hatched and labeled "A" at the center.

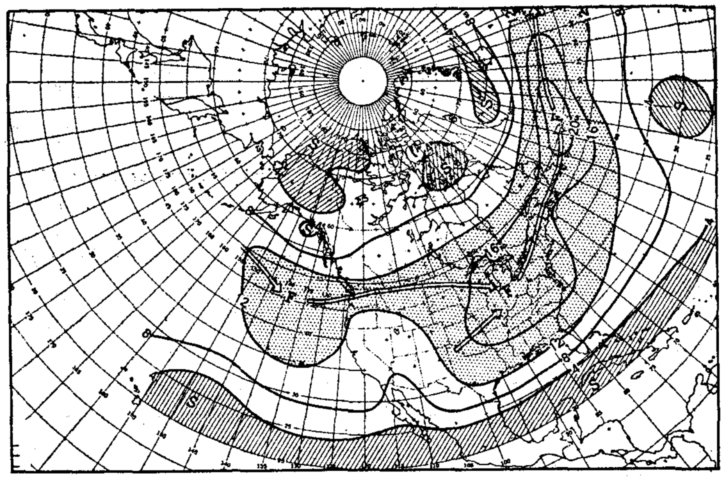


FIGURE 3.—Mean geostrophic (total horizontal) wind speed at 700 mb. for the 30-day period January 1–30, 1952. Solid lines are isotachs at intervals of 4 m/sec while the double arrowed lines delineate the axes of maximum wind speeds (jets). Areas with speeds in excess of 12 m/sec are stippled while those with less than 4 m/sec are hatched. Centers of maximum and minimum wind speed are labeled "F" and "S" respectively.

motion (Charts XII–XV). At 700 mb. (fig. 1) the trough over eastern North America was split into two portions between 35° and 45° N., the northern portion terminating in the Central Mississippi Valley, and the southern portion extending southeastward from Cape Cod. Heights were above normal at almost all latitudes in this complex trough, while in the ridge over western North America heights were markedly below normal. Thus the flow across most of the United States and southern Canada was less northerly than normal for January, and, consequently, outbreaks of cold polar continental air into the United States were less frequent and less severe than usual. In fact, Chart IX shows that most of the anticyclone centers which originated in or traversed the northwest Canadian source region moved almost directly eastward across southern Canada. Of those which did cross into the United States only the one which was in North Carolina on the 31st penetrated south of 35° N. It is evident from Chart IX that there were many other daily anticyclones traversing the United States during this month, but most of these centers originated east of the Continental Divide as offshoots from the semi-permanent "Basin High" and were composed predominantly of mild modified Pacific maritime polar air.

It is also interesting to point out the direct relationship between the pattern of 700-mb. height departure from normal (fig. 1) and the surface temperature anomaly (Chart I–B). Note especially that the maximum positive height departure from normal over the United States is located in east Texas, where the greatest positive surface temperature anomaly occurred.

Other important features of the circulation pattern aloft were the abnormally deep trough off the west coast of North America and the abnormally strong ridge to its west, extending from western Alaska to a High center northeast of Hawaii. The anomaly patterns of sea level pressure and 700-mb. height were fairly similar in this region, with pressures as much as 11 mb. below normal in the Low in the eastern Gulf of Alaska (Chart XI). The close spacing of the lines of both 700-mb. height and sea level pressure departure from normal in the western Gulf of Alaska indicates the presence of strong northerly and northwesterly flow relative to normal. This flow pattern was responsible for frequent invasions of the western United States by fresh maritime polar air with short cyclonic trajectory over the northeast Pacific. Such air masses are notorious for producing wet, chilly weather along the West Coast (Charts I–B and III).

Cyclonic activity in the Gulf of Alaska and along the West Coast (Chart X) was extremely frequent and intense. The intensity of mean cyclonic vorticity in the deep 700-mb. trough in this region is clearly portrayed in figure 2. As many as 11 individual daily storm centers traversed an area of the northeastern Gulf of Alaska between 55° and 60° N. and 135° and 145° W. during the month. Close inspection of the tracks in Chart X reveals that in the first two-thirds of the month the bulk of the storms moved eastward and southeastward near the coastal boundary of the Gulf of Alaska. Near mid-month a few storms dropped as far south as coastal California at the time when the eastern Pacific trough reached its greatest intensity at lower latitudes. These cyclones, and several fronts moving eastward during the second decade of the month, produced some extremely heavy precipitation in California and other parts of the Southwest (Chart III). Intense rainfall at lower elevations resulted in flooding of many streams in Arizona and central and southern California, and deep snowfall at higher elevations in the Sierras blocked highways and railroad lines.[2] Additional significant precipitation fell in California on the 24th and 25th as a storm approached the

[2] Details about the most damaging storm of this series can be found in the following article by Carr.

coast from the west-southwest and crossed northern California. This general orientation of storm tracks from southwest to northeast in the eastern Pacific in the last decade of the month was associated with weakening of the mean trough along the West Coast and development of southwesterly flow aloft in the eastern Pacific.

Cyclones traversed most sections of North America east of the Continental Divide during January (Chart X), as indicated by the predominance of cyclonic vorticity over most of Canada and the northern half of the United States east of the Divide (fig. 2). The prevailing storm path in the United States ran roughly from the Central Plains northeastward across the Great Lakes and closely followed the axis of maximum wind speed at 700 mb. (fig. 3). The tracks of the more intense storms were mostly located just north of this axis, generally following the channel of cyclonic vorticity shown in figure 2. To the north of these storms, in the Northern Plains and the Lakes region, precipitation, largely in the form of snow, was in excess of normal (Charts III and V–A). To the south of the paths of the major storms, over the southern half of the Plains States and also along the eastern slopes of the Rockies, precipitation amounts were generally subnormal. This is not surprising in view of the relatively flat prevailing westerly flow across the Divide and the lack of continental polar air masses banked against the east side of the Rockies. Thus Pacific air blowing over the Divide descended the eastern slopes almost unhampered by stagnant cold continental air masses, so that dry warm weather typical of pronounced foehn activity was the rule. At Caspar and Cheyenne, Wyo., and Rapid City, S. Dak., no measurable precipitation fell during the entire month (Chart II).

Precipitation was also deficient in the Southeast, where anticyclonic conditions and above-normal heights prevailed at 700 mb. (figs. 1 and 2). In other sections east of the Mississippi, northward from Tennessee and North Carolina, precipitation amounts generally exceeded the seasonal normals. This is attributable to the mean trough at 700 mb. extending northeastward from the central Mississippi Valley (fig. 1) and the stronger-than-normal flow from the Gulf of Mexico at sea level (Chart XI). The most excessive precipitation in this region occurred in the Ohio Valley where heavy rains fell during the last week of the month. Thunderstorms were reported at this time and some stations in Ohio recorded rainfall amounts totaling as much as 3 inches in 24 hours.

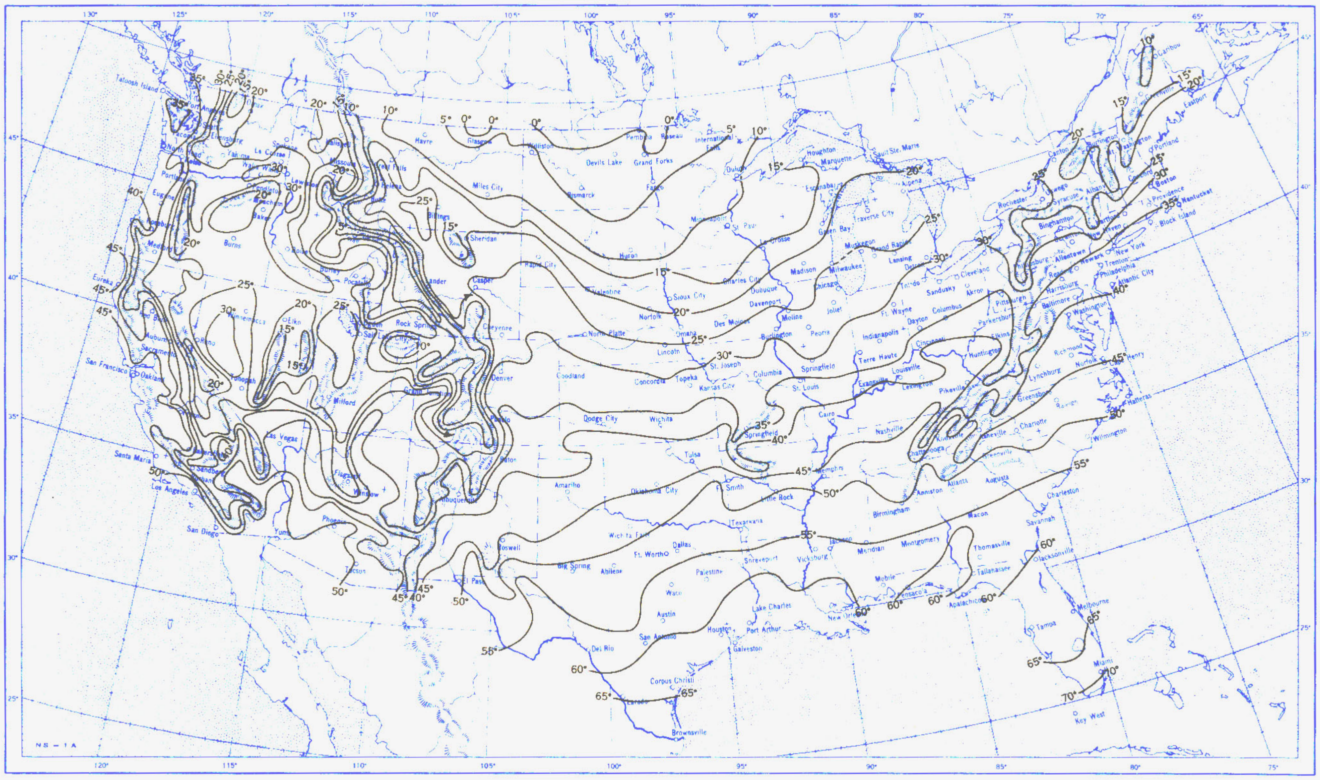
Several cyclones developed near the east coast of the United States and contributed to much of the heavy precipitation along the Atlantic Seaboard. Most of these deepened in the region of cyclonic vorticity (fig. 2) off the northeast section of the coast. About half of these storms traveled northward into the broad area of stronger cyclonic vorticity in northeastern Canada and the Greenland-Iceland area. The remaining half of these cyclones were steered east-northeastward across the Atlantic, generally parallel to the monthly mean contours (fig. 1), and rather close to the pronounced monthly mean 700-mb. jet stream across the northern sections of the Atlantic (fig. 3).

The westerlies in the northeastern Atlantic between latitudes 50° and 60° N. were considerably stronger than normal, as evidenced by the strong meridional gradient of 700-mb. height anomaly lines in that region. This was associated with an abnormally strong ridge in the eastern Atlantic at middle latitudes (heights 520 ft. above normal) and a deep trough from Iceland northeastward to Spitzbergen. The axis of maximum mean monthly winds at 700 mb. (fig. 3) was located across the southern British Isles. The persistence of this jet stream from the previous month [1] resulted in continuing storminess in the vicinity of the British Isles especially in the first fortnight of the month. It was during this period that the freighter *Flying Enterprise*, which had been crippled by storminess late in December, finally sank as all efforts to save her failed in the tempestuous seas off Falmouth, England.

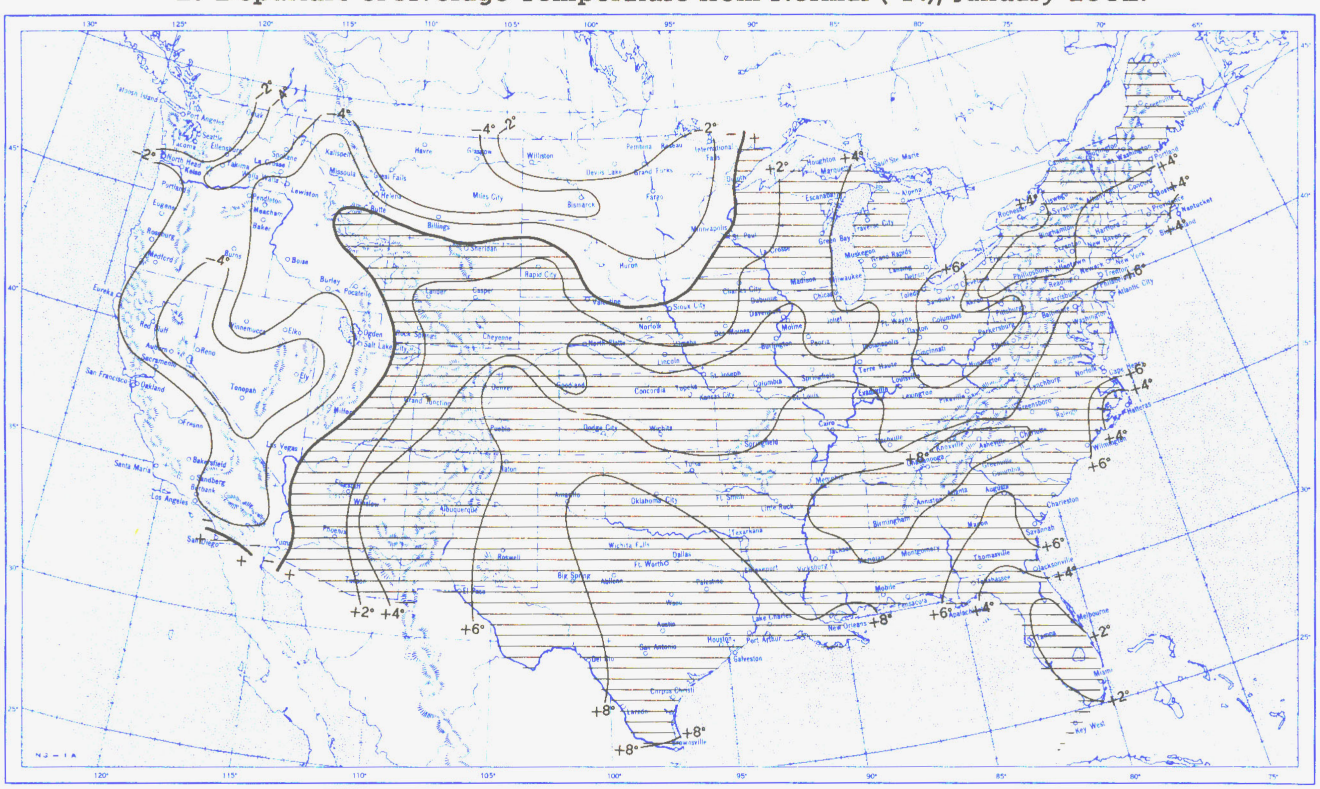
REFERENCE

1. W. H. Klein, "The Weather and Circulation of December 1951," *Monthly Weather Review*, vol. 79, No. 12, December 1951, pp. 218–221.

Chart I. A. Average Temperature (°F.) at Surface, January 1952.

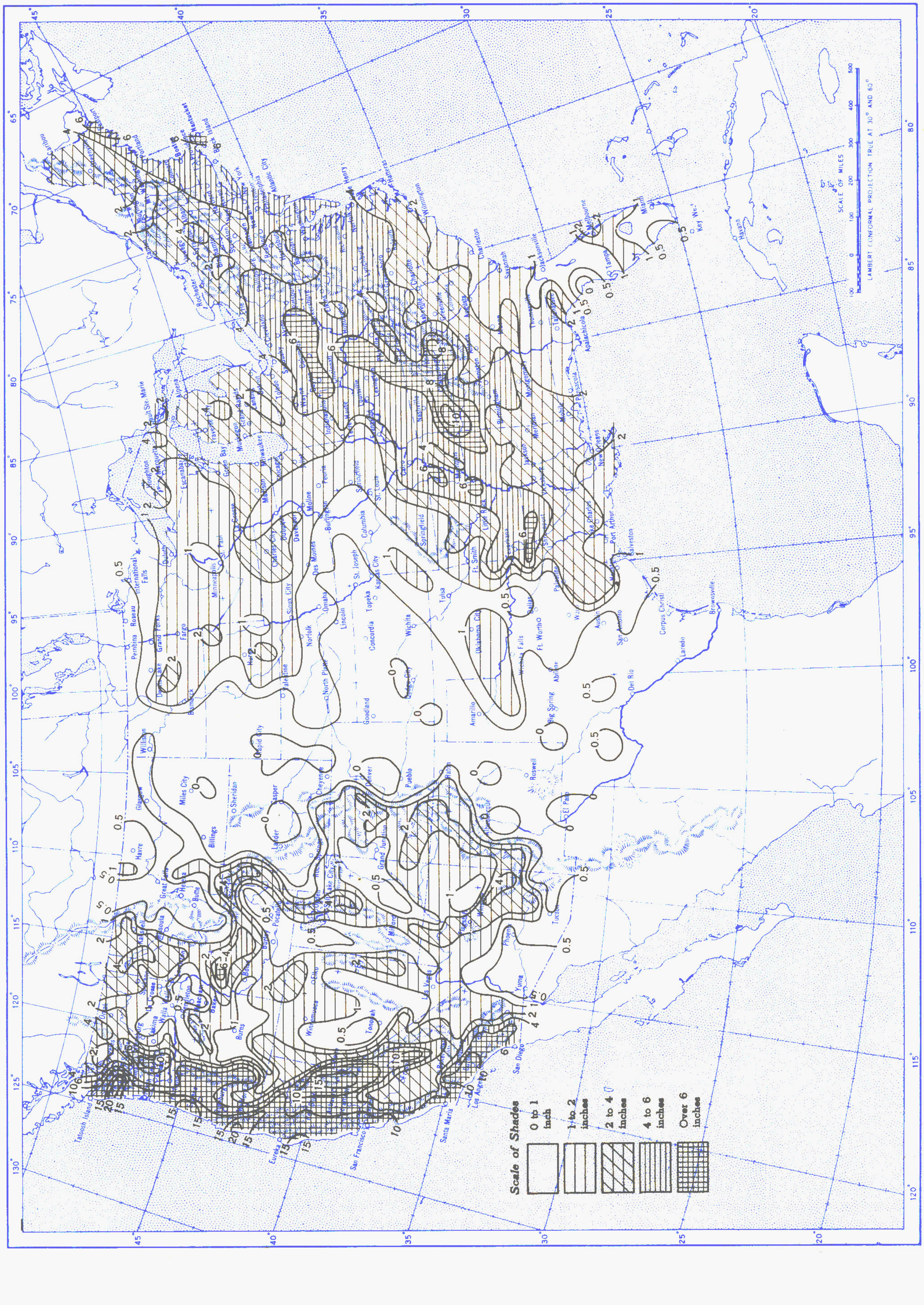


B. Departure of Average Temperature from Normal (°F.), January 1952.



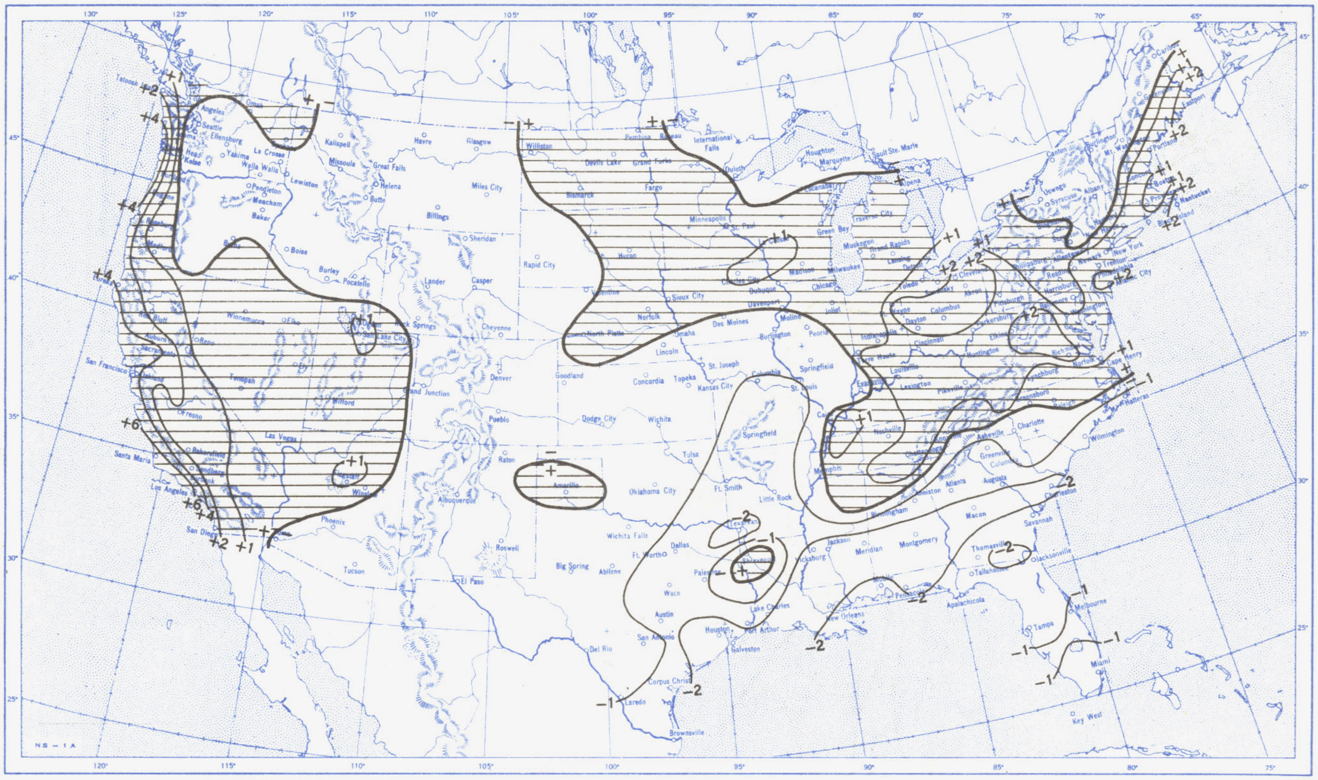
A. Based on reports from 800 Weather Bureau and cooperative stations. The monthly average is half the sum of the monthly average maximum and monthly average minimum, which are the average of the daily maxima and daily minima, respectively.
B. Normal average monthly temperatures are computed for Weather Bureau stations having at least 10 years of record.

Chart II. Total Precipitation (Inches), January 1952.

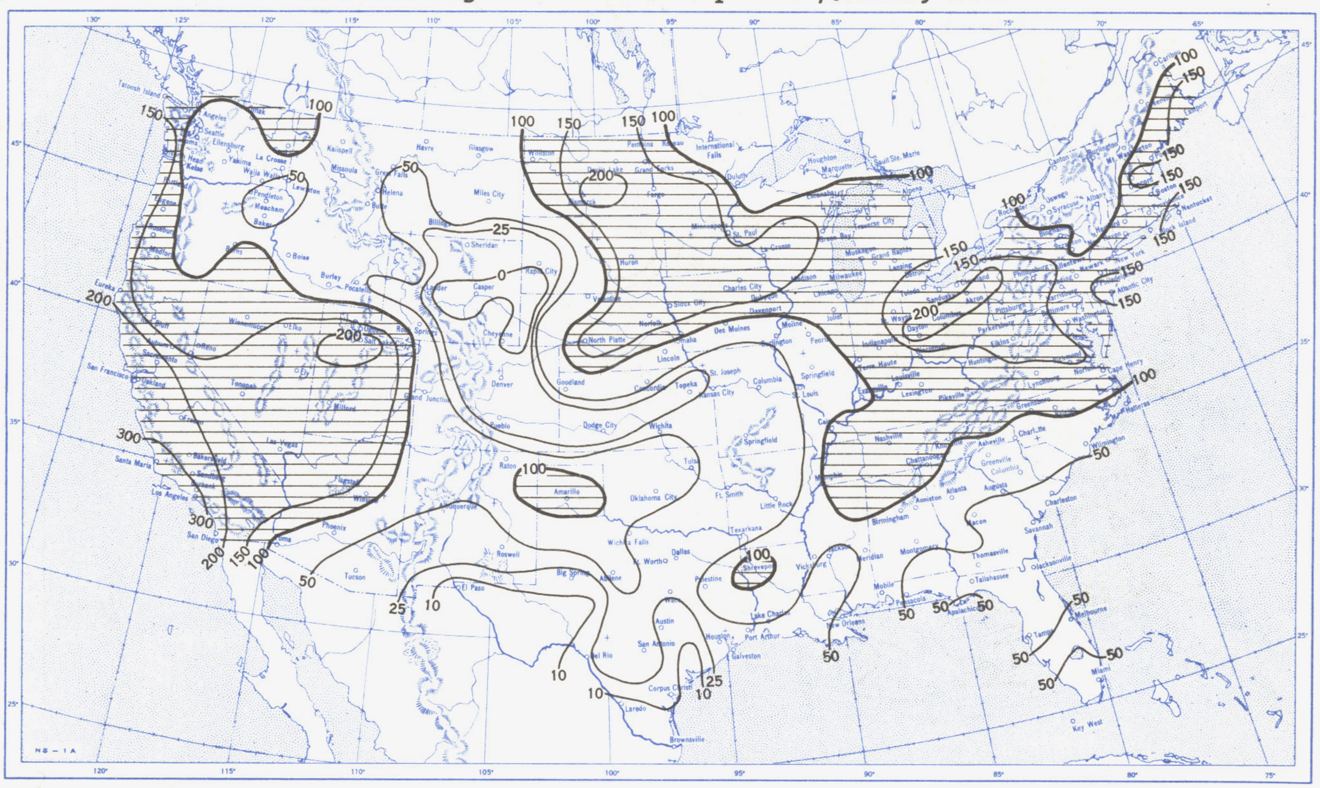


Based on daily precipitation records at 800 Weather Bureau and cooperative stations.

Chart III. A. Departure of Precipitation from Normal (Inches), January 1952.

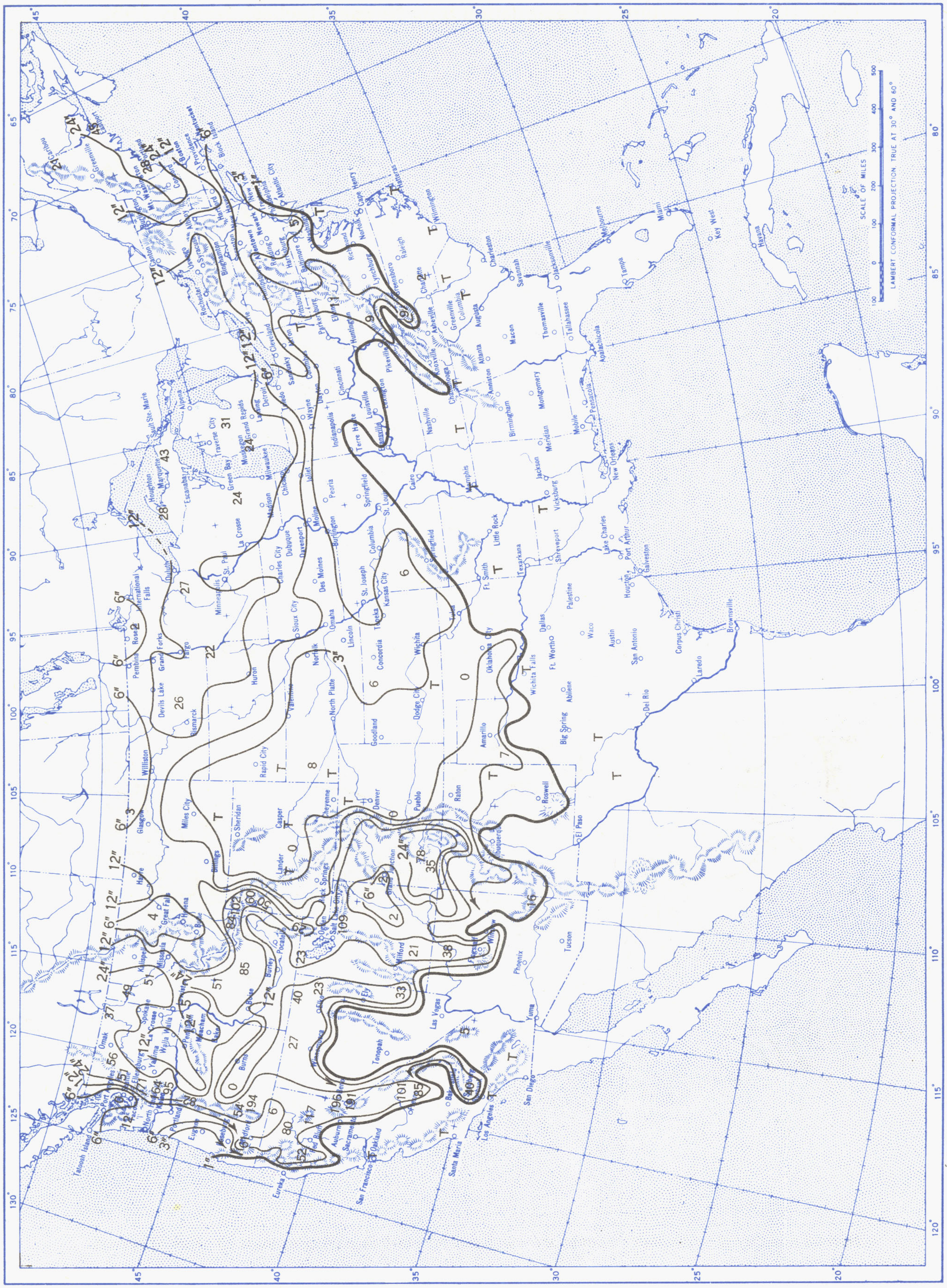


B. Percentage of Normal Precipitation, January 1952.



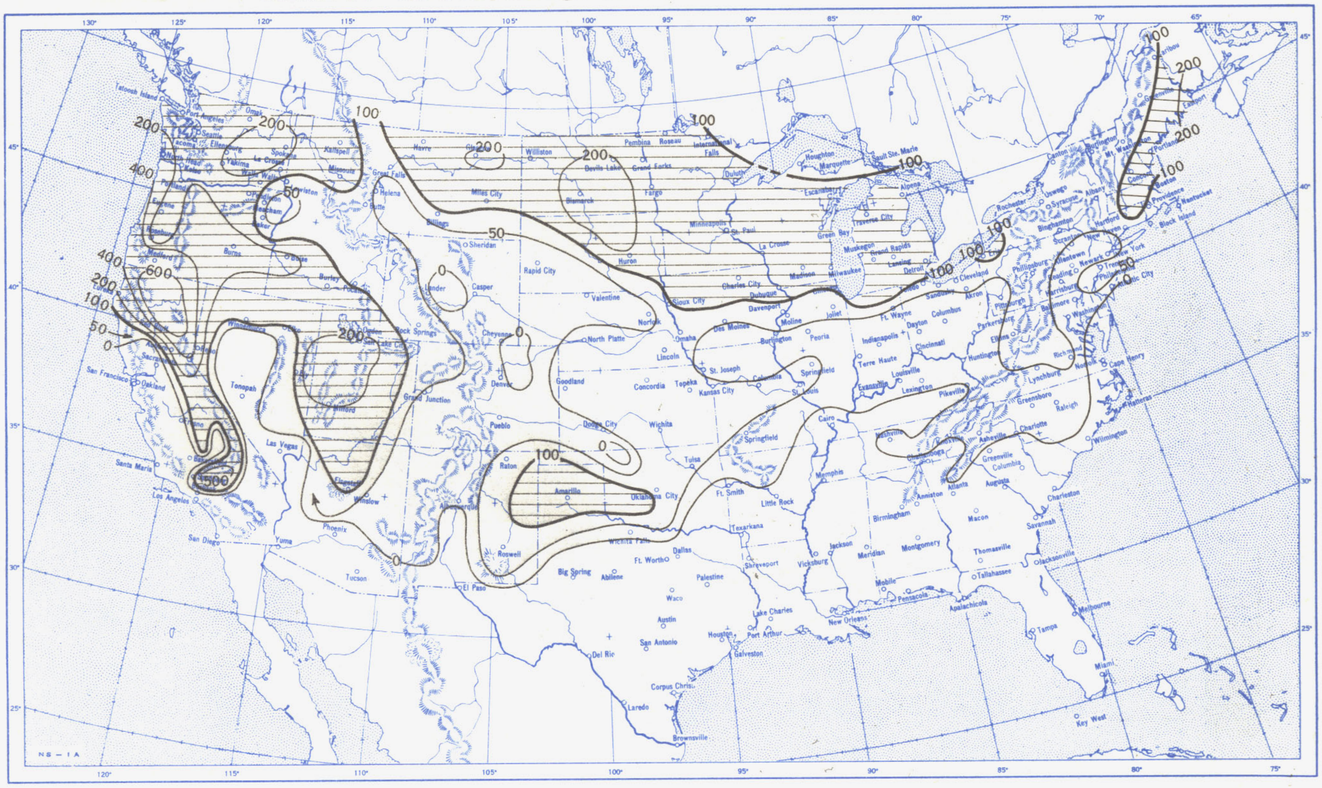
Normal monthly precipitation amounts are computed for stations having at least 10 years of record.

Chart IV. Total Snowfall (Inches), January 1952.

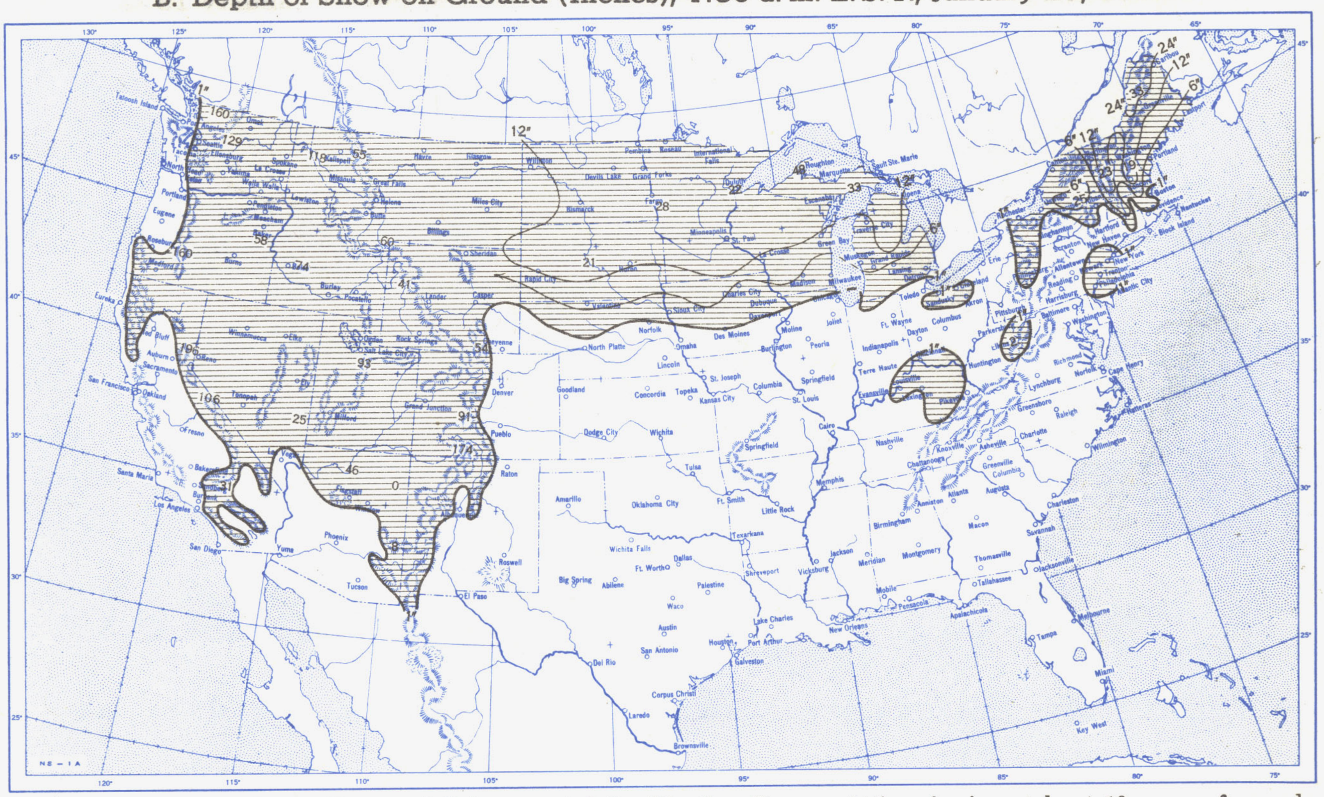


This is the total of unmelted snowfall recorded during the month at Weather Bureau and cooperative stations. This chart and Chart V are published only for the months of November through April although of course there is some snow at higher elevations, particularly in the far West, earlier and later in the year.

Chart V. A. Percentage of Normal Snowfall, January 1952.

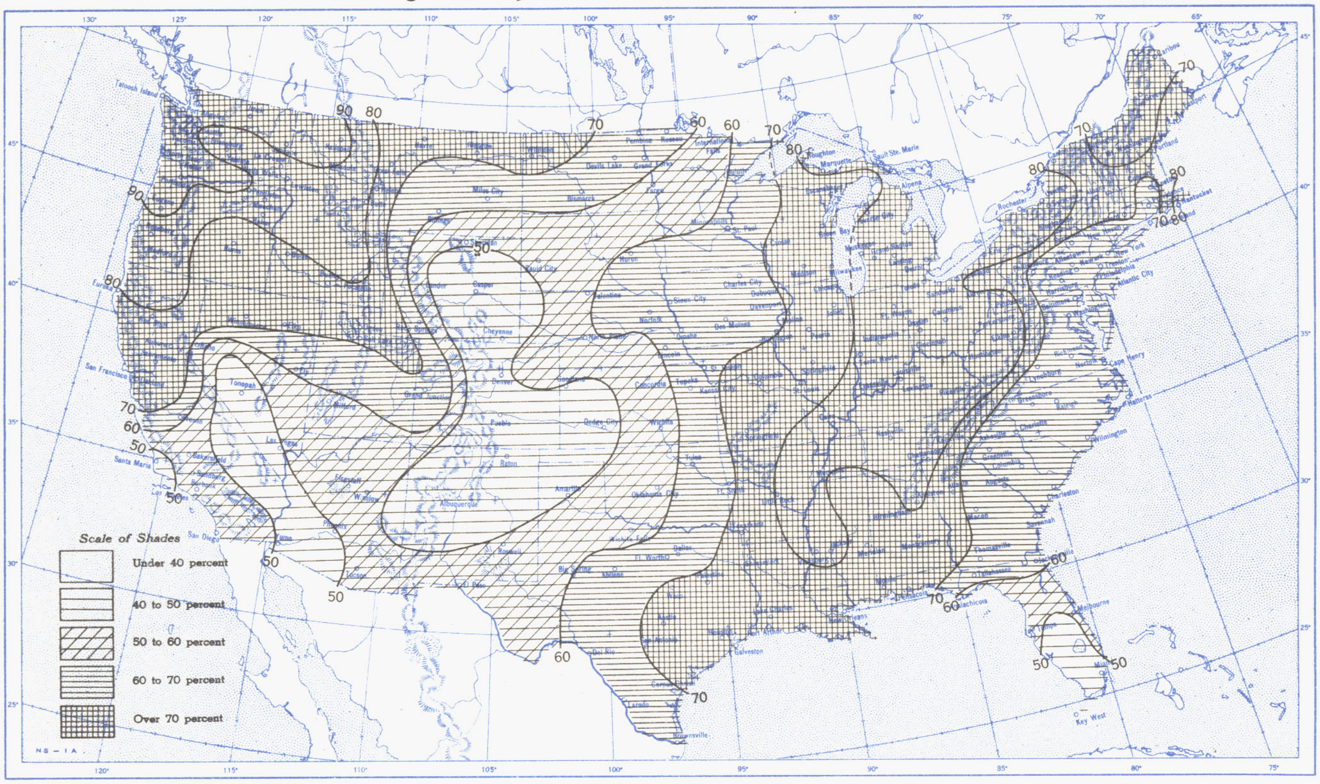


B. Depth of Snow on Ground (Inches), 7:30 a. m. E. S. T., January 29, 1952.

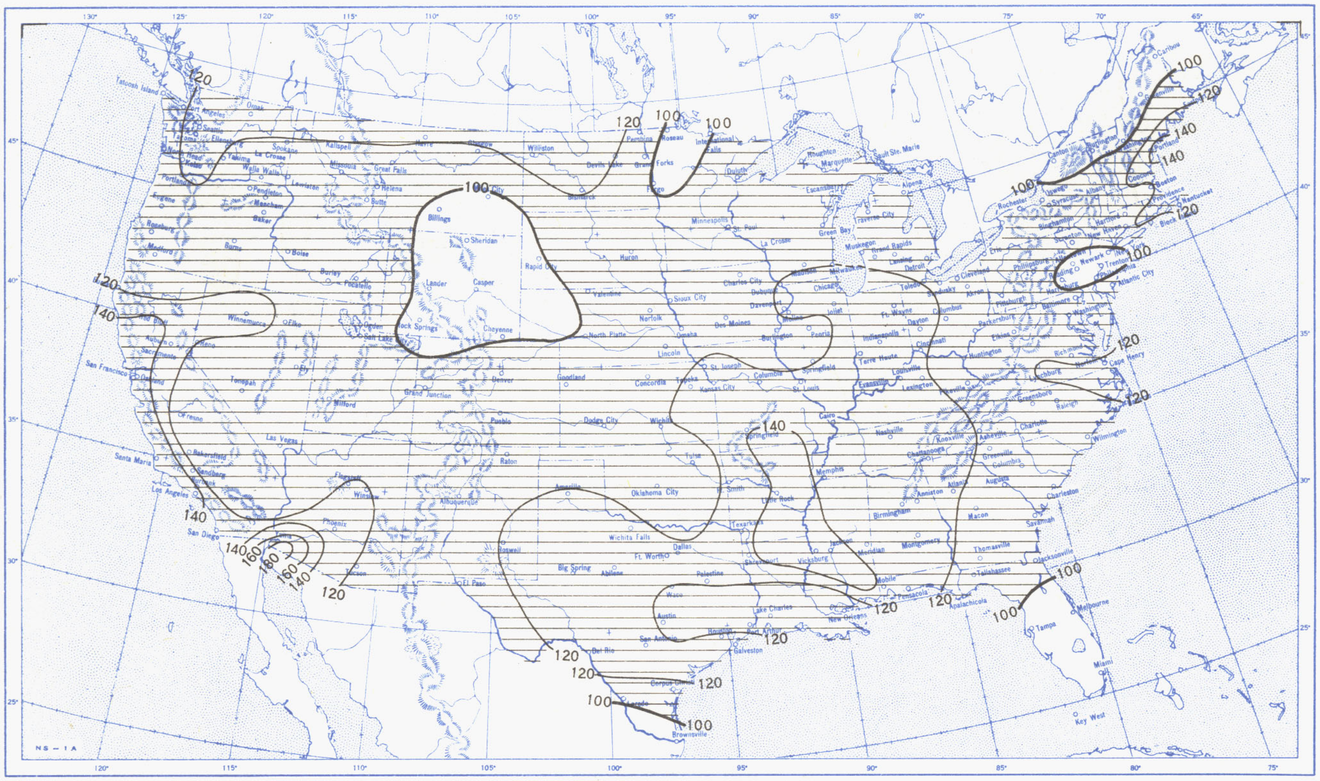


A. Amount of normal monthly snowfall is computed for Weather Bureau stations having at least 10 years of record.
B. Shows depth currently on ground at 7:30 a. m. E. S. T., of the Tuesday nearest the end of the month. It is based on reports from Weather Bureau and cooperative stations. Dashed line shows greatest southern extent of snowcover during month.

Chart VI. A. Percentage of Sky Cover Between Sunrise and Sunset, January 1952.

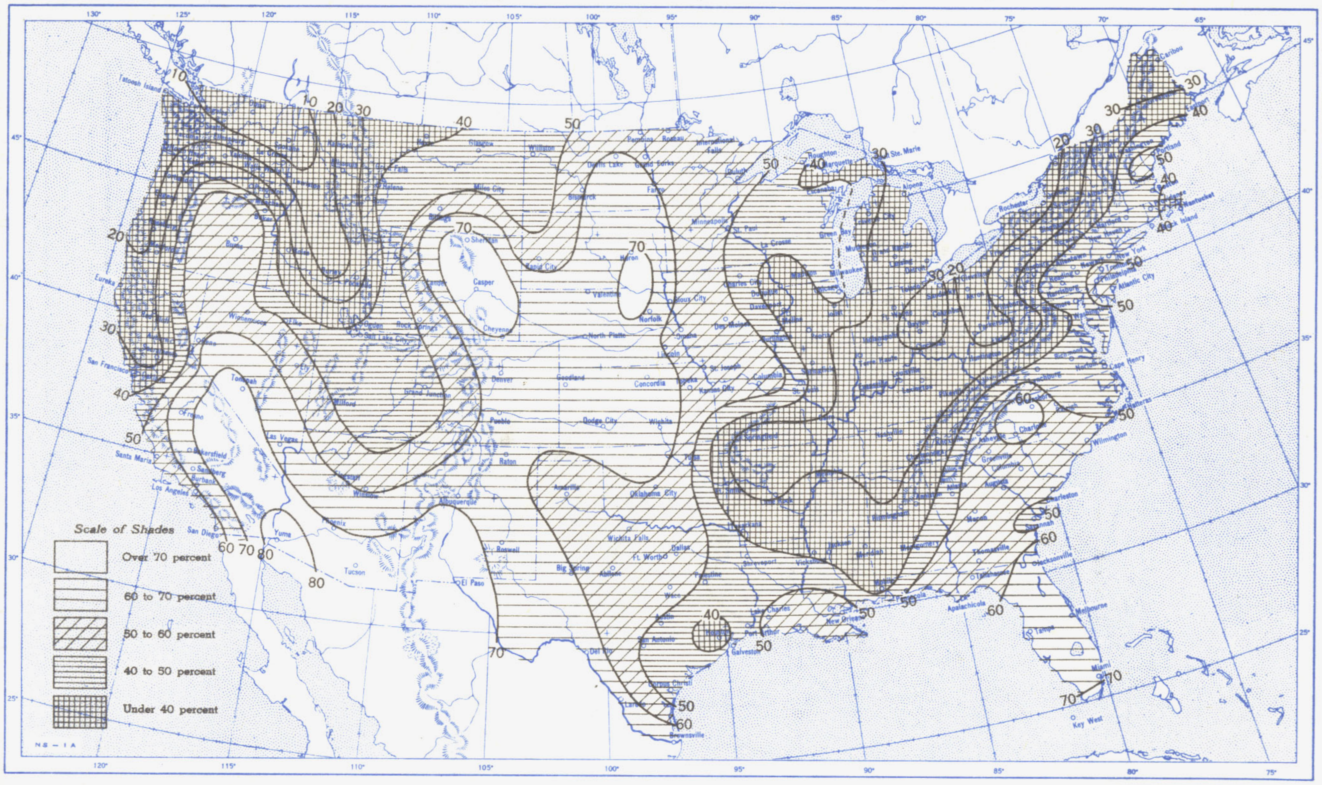


B. Percentage of Normal Sky Cover Between Sunrise and Sunset, January 1952.

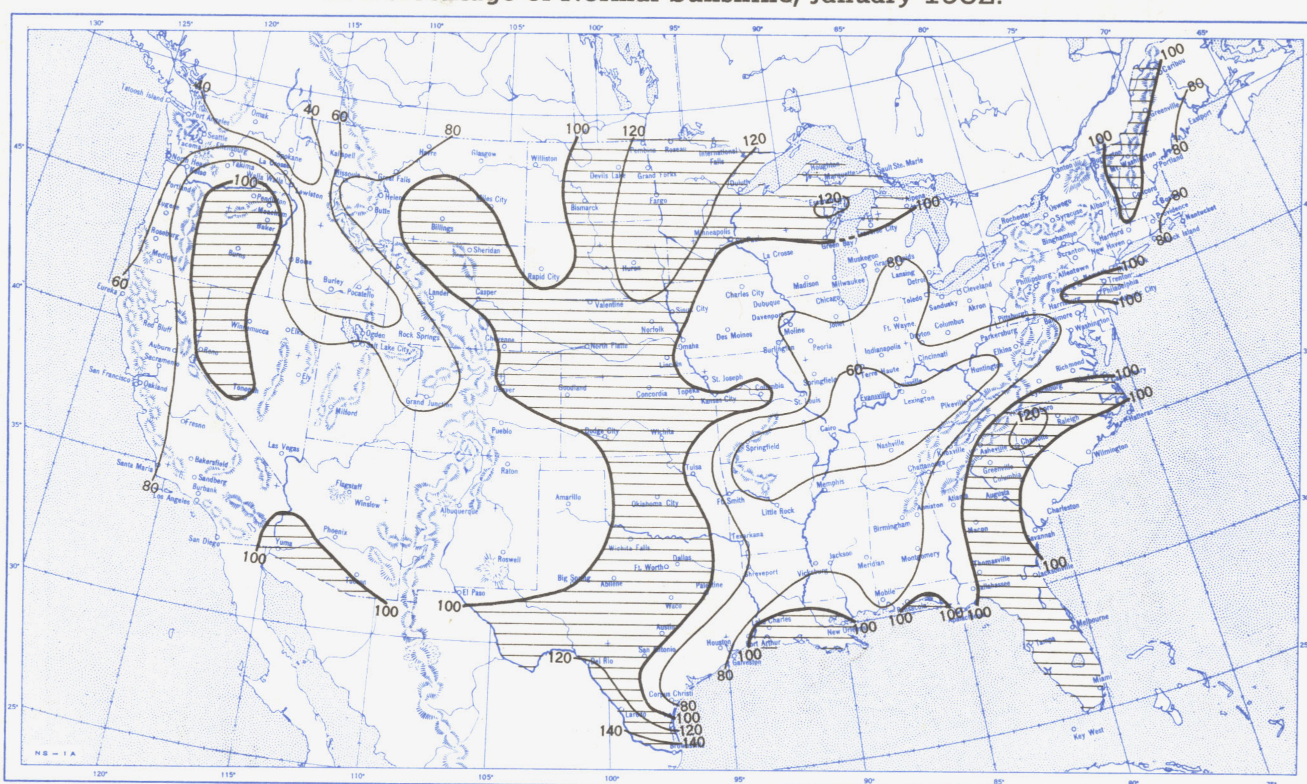


A. In addition to cloudiness, sky cover includes obscuration of the sky by fog, smoke, snow, etc. Chart based on visual observations made hourly at Weather Bureau stations and averaged over the month. B. Computations of normal amount of sky cover are made for stations having at least 10 years of record.

Chart VII. A. Percentage of Possible Sunshine, January 1952.



B. Percentage of Normal Sunshine, January 1952.



A. Computed from total number of hours of observed sunshine in relation to total number of possible hours of sunshine during month. B. Normals are computed for stations having at least 10 years of record.

Chart VIII. Average Daily Values of Solar Radiation, Direct + Diffuse, January 1952. Inset: Percentage of Normal Average Daily Solar Radiation, January 1952.

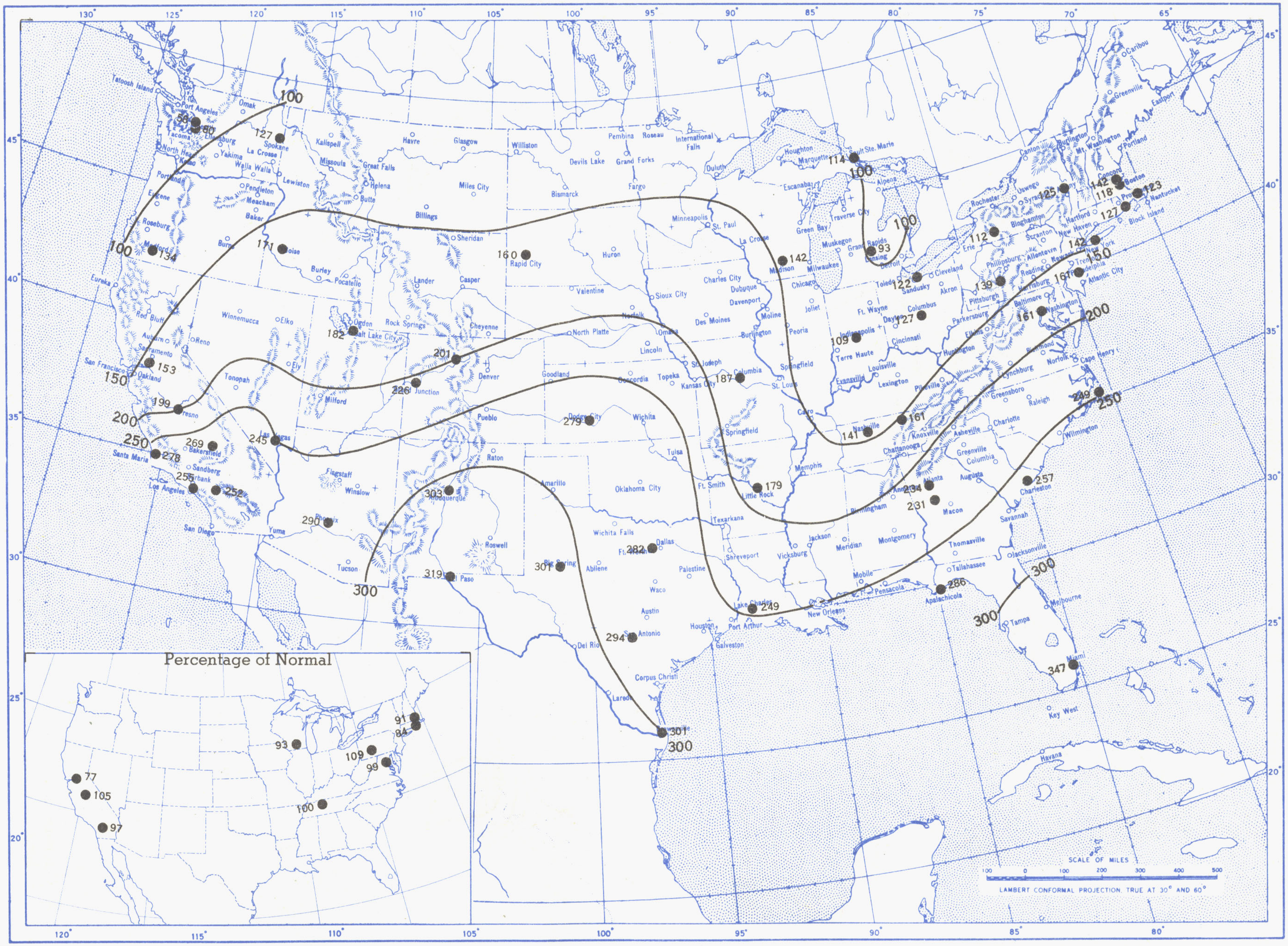
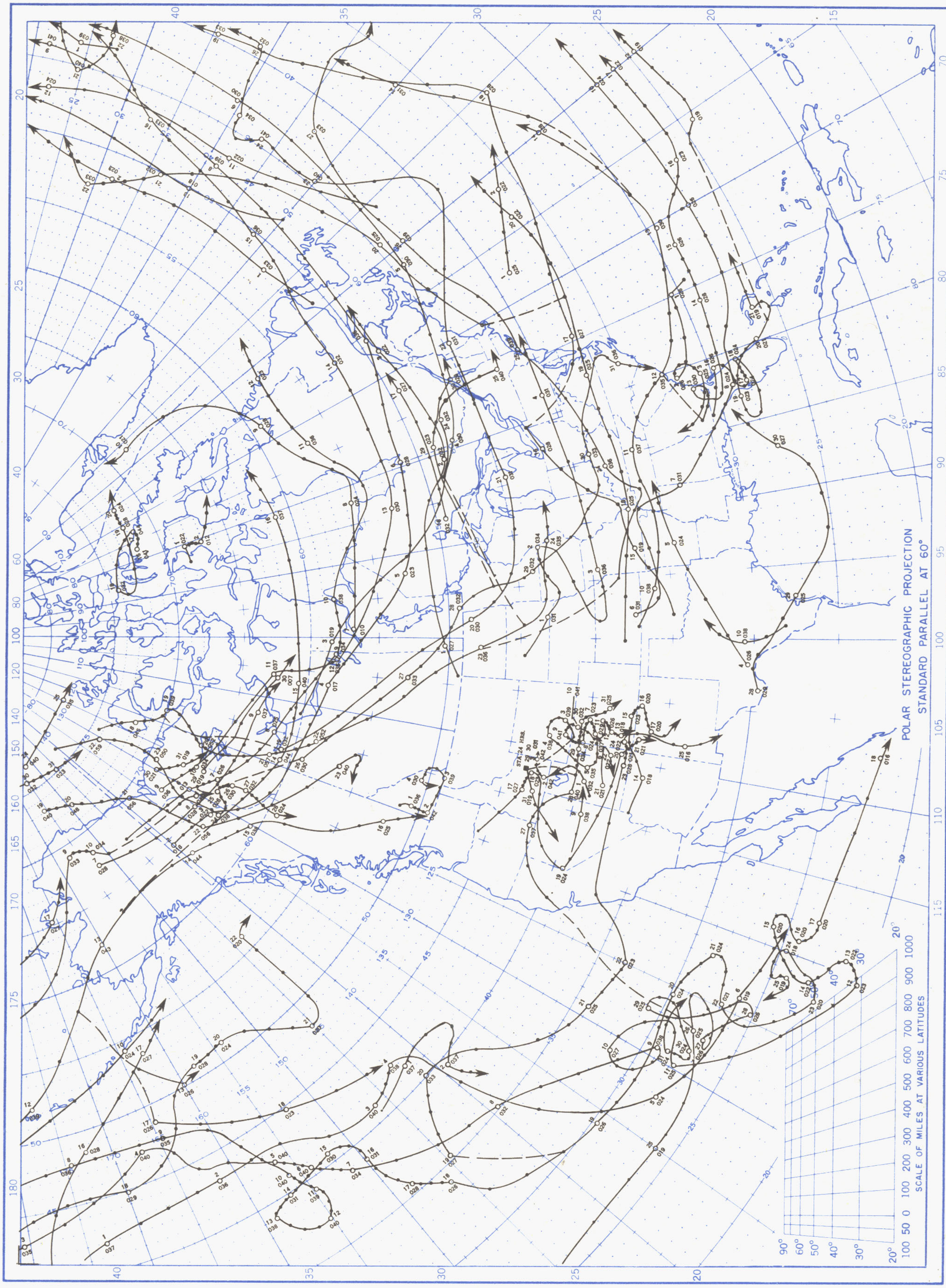


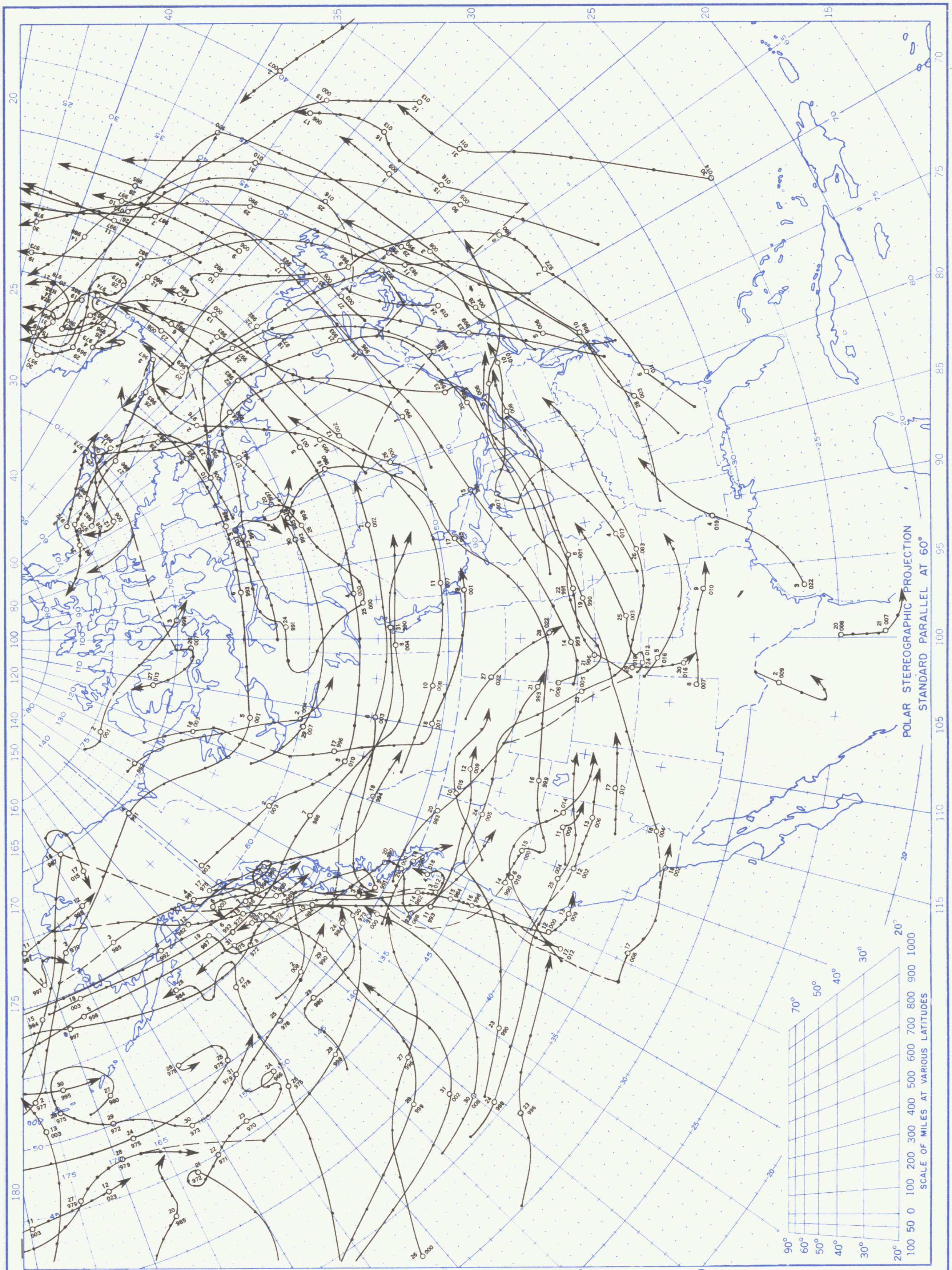
Chart shows mean daily solar radiation, direct + diffuse, received on a horizontal surface in langleys (1 langley = 1 gm. cal. cm.$^{-2}$). Basic data for isolines are shown on chart. Further estimates obtained from supplementary data for which limits of accuracy are wider than for those data shown. Normals are computed for stations having at least 9 years of record.

Chart IX. Tracks of Centers of Anticyclones at Sea Level, January 1952.



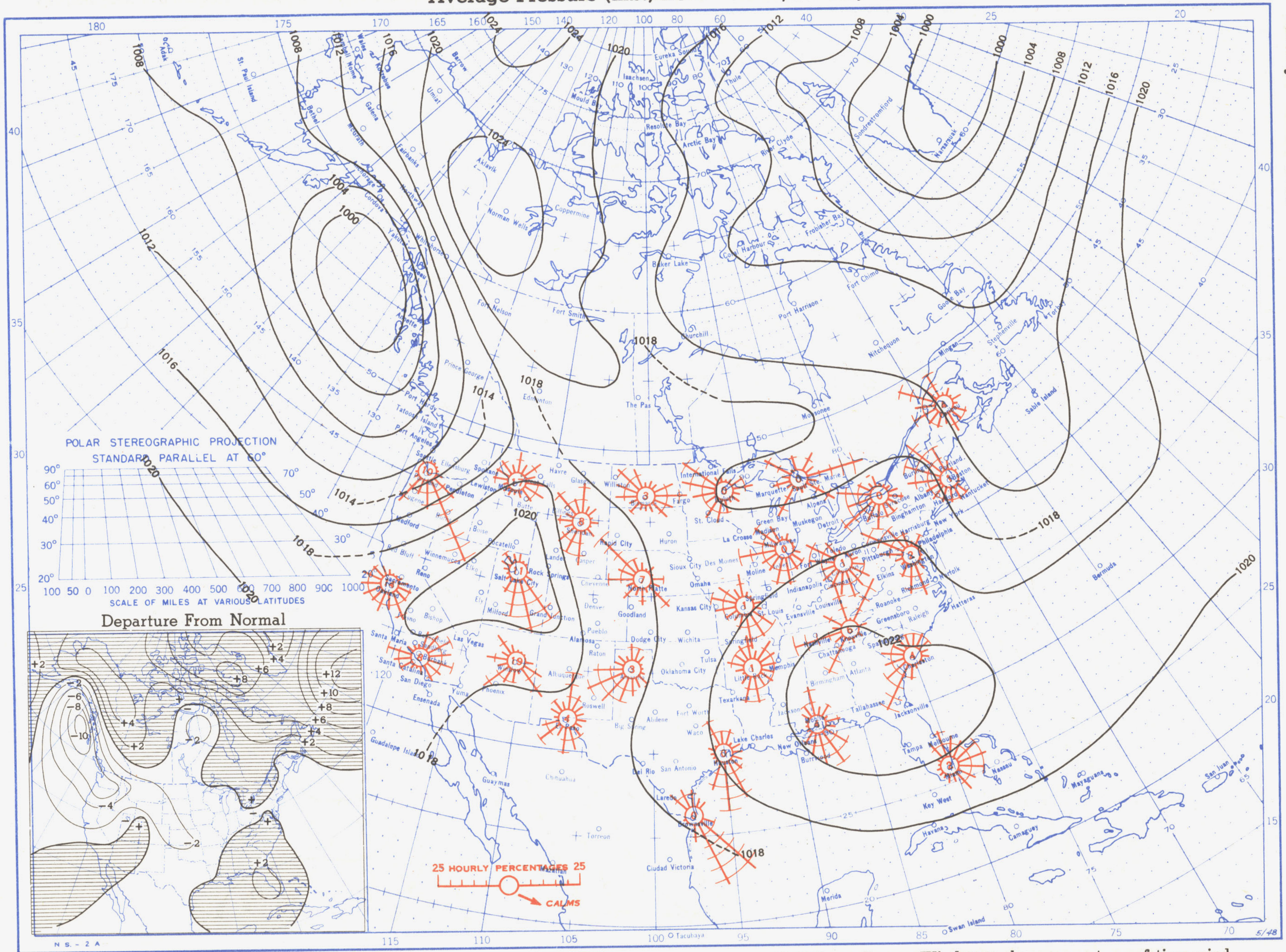
Circle indicates position of center at 7:30 a. m. E. S. T. Figure above circle indicates date, figure below, pressure to nearest millibar. Dots indicate intervening 6-hourly positions. Squares indicate position of stationary center for period shown. Dashed line in track indicates reformation at new position. Only those centers which could be identified for 24 hours or more are included.

Chart X. Tracks of Centers of Cyclones at Sea Level, January 1952.



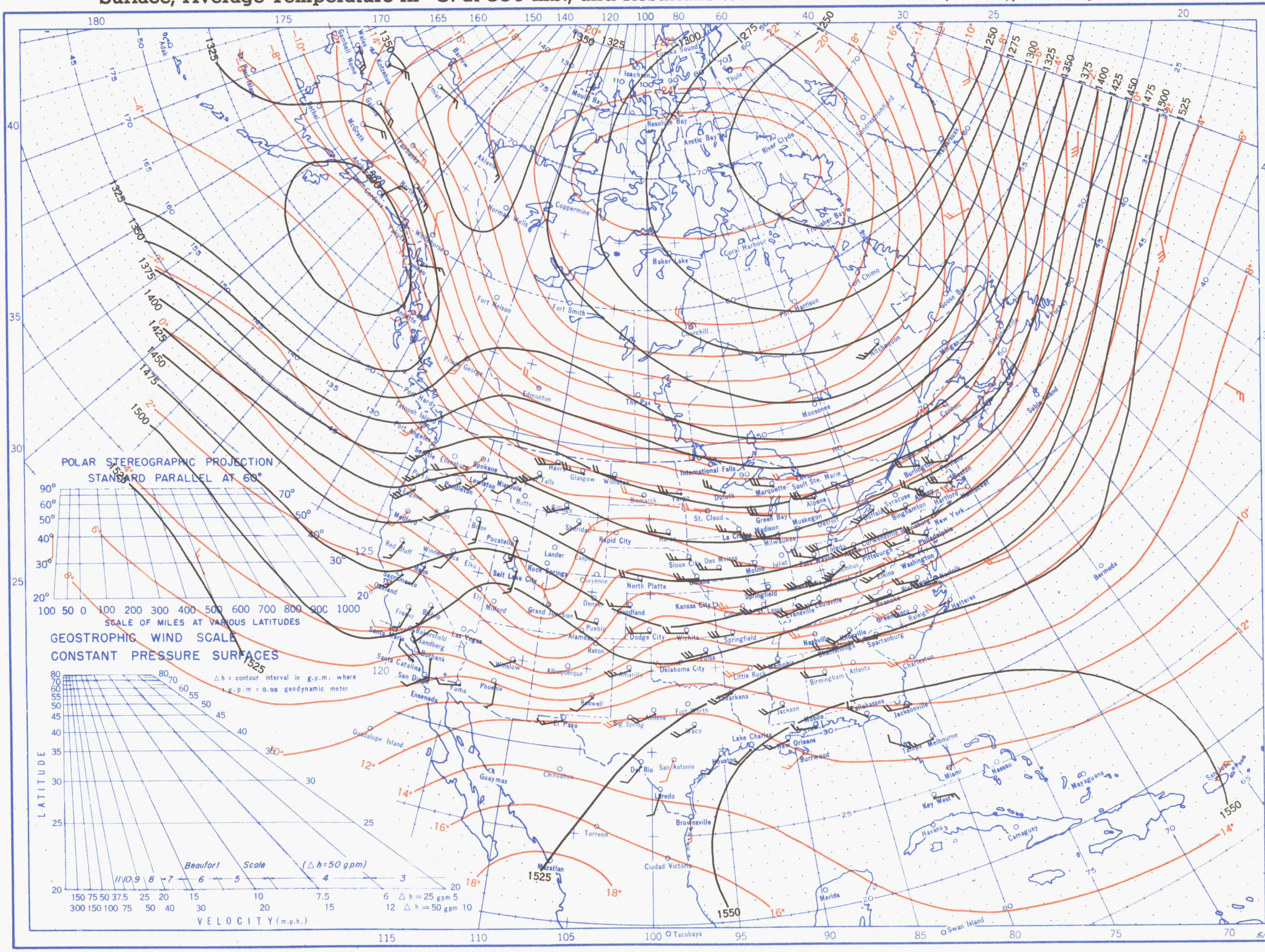
Circle indicates position of center at 7:30 a. m. E. S. T. See Chart IX for explanation of symbols.

Chart XI. Average Sea Level Pressure (mb.) and Surface Windroses, January 1952. Inset: Departure of Average Pressure (mb.) from Normal, January 1952.



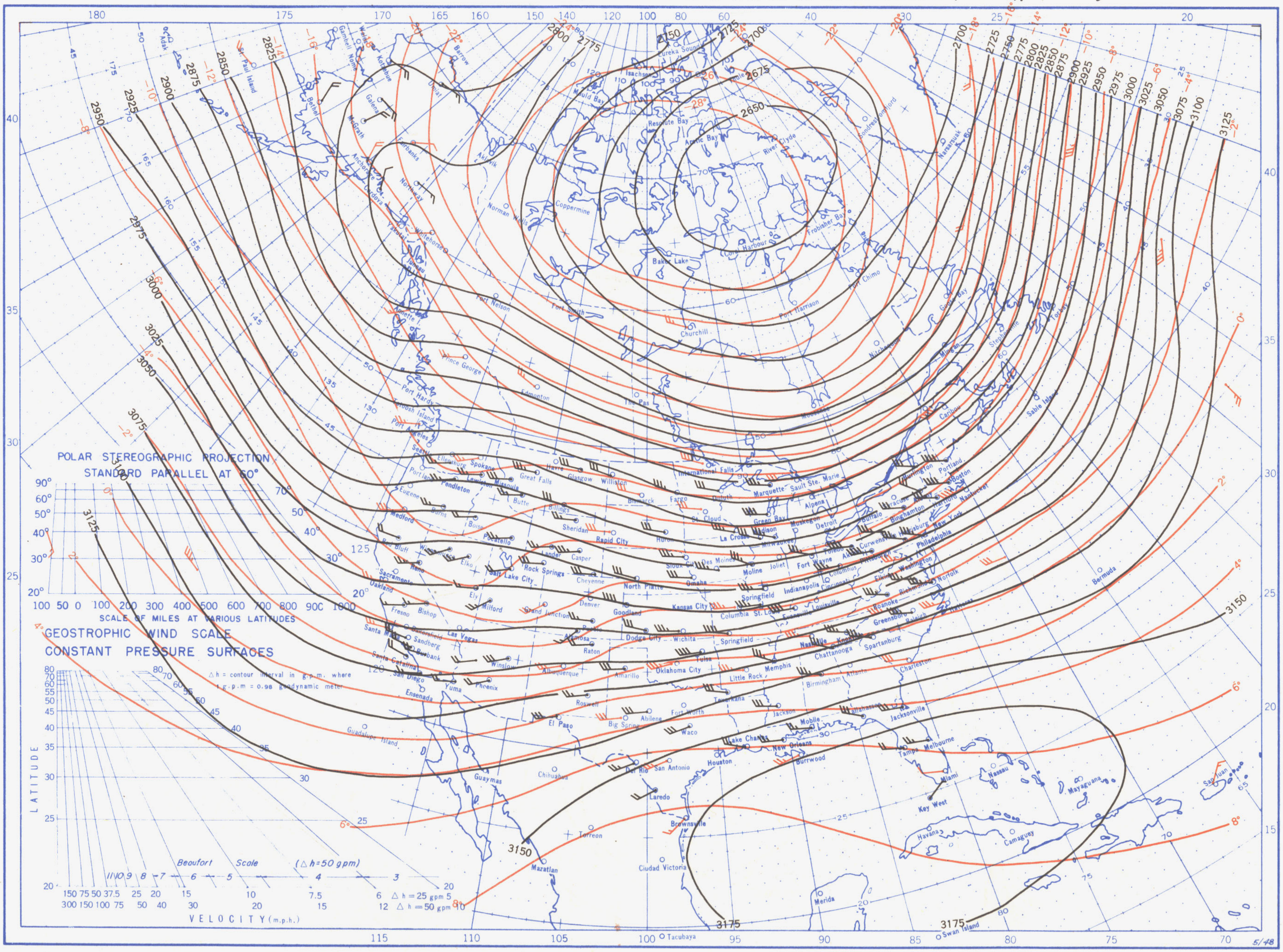
Average sea level pressures are obtained from the averages of the 7:30 a. m. and 7:30 p. m. E. S. T. readings. Windroses show percentage of time wind blew from 16 compass points or was calm during the month. Pressure normals are computed for stations having at least 10 years of record and for 10° intersections in a diamond grid based on readings from the Historical Weather Maps (1899-1939) for the 20 years of most complete data coverage prior to 1940.

Chart XII. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 850-mb. Pressure Surface, Average Temperature in °C. at 850 mb., and Resultant Winds at 1500 Meters (m.s.l.), January 1952.



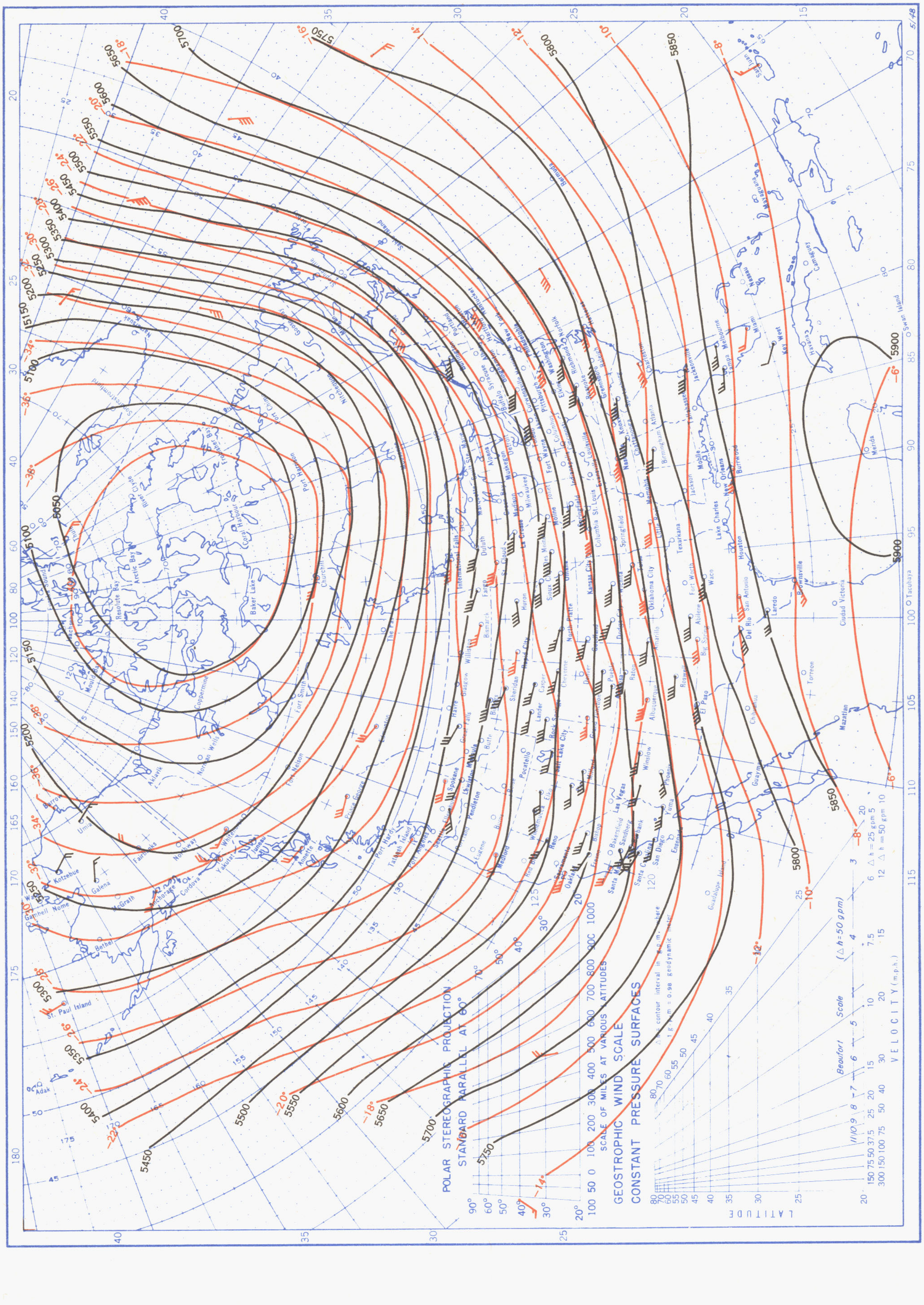
Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T.

Chart XIII. Average Dynamic Height in Geopotential Meters (1 g.p.m.. = 0.98 dynamic meters) of the 700-mb. Pressure Surface, Average Temperature in °C. at 700 mb., and Resultant Winds at 3000 Meters (m.s.l.), January 1952.



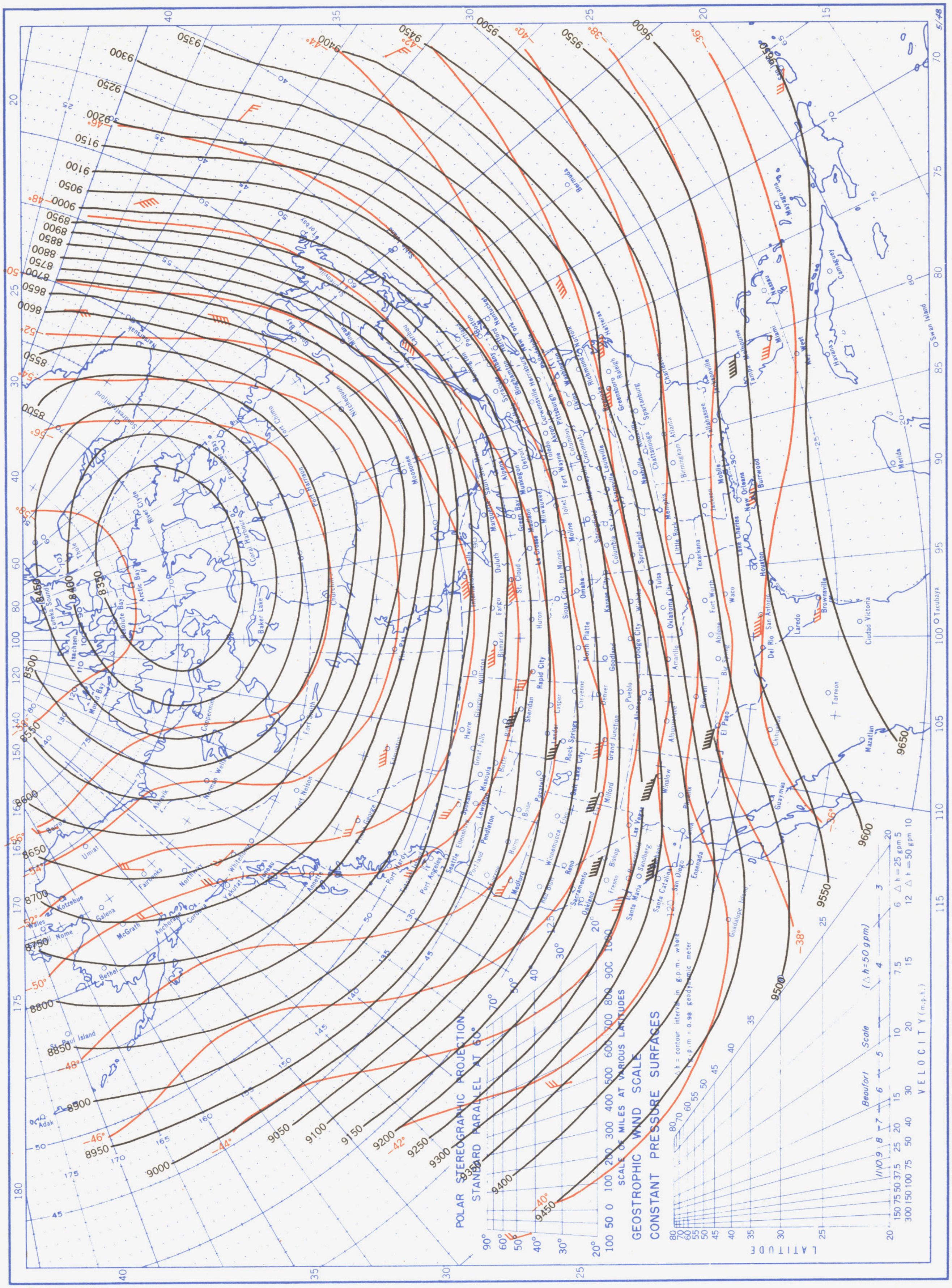
Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T.

Chart XIV. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 500-mb. Pressure Surface, Average Temperature in °C. at 500 mb., and Resultant Winds at 5000 Meters (m.s.l.), January 1952.



Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins at 0300 G. M. T.

Chart XV. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 300-mb. Pressure Surface, Average Temperature in °C. at 300 mb., and Resultant Winds at 10,000 Meters (m.s.l.), January 1952.



Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins at 0300 G. M. T.